



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/758,109	01/16/2004	Vladimir Vladimirovich Popov	BOE01 043	5000

7590 03/10/2005
MARK C. COMPTOIS
Duane Morris LLP
Suite 700
1667 K Street, N.W.
Washington, DC 20006

EXAMINER

NGUYEN, TRAN N

ART UNIT PAPER NUMBER

2834

DATE MAILED: 03/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/758,109

Applicant(s)

POPOV, VLADIMIR
VLADIMIROVICH

Examiner

Tran N. Nguyen

Art Unit

2834

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-8 and 12-37 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☐ Claim(s) 1-8 and 12-37 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION***Drawings***

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, *the stator's groove or the rotor's groove is not axially aligned, as in claim 16, or randomly distributed, in claim 32, or the groove is skewed, as in claim 17, 21, 28, 34, 37* must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended-replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes that are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. **Claims 1-4, 12-17 and 23** are rejected under 35 U.S.C. 102(b) as being fully anticipated by **Banzi (EP 0 803 962 B1)**.

Banzi discloses an electric machine (figs 1-2), particularly an alternator (col 1, lines 5-7) having a rotor assembly (1) comprising:

a rotor body (1) of substantially cylindrical shape having an outer surface facing an gap between the rotor assembly and a stator (not shown, but inherently be housing the rotor) of the electrical machine, and

a plurality of permanent magnets (41) embedded in said rotor body, wherein the outer surface of the rotor body defines at least one groove (40) for manipulating the distribution of magnetic flux of said permanent magnets.

The groove (40) manipulates the distribution of magnetic flux of said permanent magnets by reducing the magnetic flux leakage thereof so that the rotor would produce a truly sinusoidal voltage wave form (col 3, lines 28-36).

Regarding claim 2, wherein the embedded magnets (41) extend substantially radially through said rotor body (fig 1).

Regarding claim 3, wherein said at least one groove (40) axially extends along the outer surface of the rotor body (fig 1).

Regarding claim 4, wherein the rotor body further comprises a plurality of cylindrical laminations (2).

Regarding claim 12, wherein said groove (40) is disposed about an end face of at least one of said permanent magnets (fig 1-2).

Art Unit: 2834

Regarding claim 13, wherein rotor core (1) is a laminated core (fig 1) with groove (40); inherently, each lamination (2) includes at least one notch (40) on a surface thereof for forming the axial groove on the rotor core's outer surface.

Regarding claim 14, wherein a plurality of laminations (2) each including at least one notch are arranged on the rotor body to form a groove (40) (Fig 1).

Regarding claim 15, wherein said groove (40) is axially aligned with an axis of the rotor (fig 1).

Regarding claims 16-17, according to Banzi, the groove (40) can be slanting, i.e., skewed angle that is not axially aligned with an axis of the rotor (col 3, lines 33-36).

Regarding claim 23, the electric machine with the rotor assembly inherently further comprising a stator (not shown).

2. **Claims 1-4, 12-15, 23-27, 29-31, and 33** are rejected under 35 U.S.C. **102(b)** as being fully anticipated by **Kim et al (US 6,087,752)**.

Kim discloses an electric machine (figs 6A-7B) having a rotor assembly (100) comprising:

a rotor body (100) of substantially cylindrical shape having an outer surface facing an gap between the rotor assembly and a stator (45) of the electrical machine, and

a plurality of permanent magnets embedded in said rotor body, wherein the outer surface of the rotor body defines at least one groove (110) for manipulating the distribution of magnetic flux of said permanent magnets.

The groove (110) manipulates the distribution of magnetic flux of said permanent magnets by reducing the magnetic flux leakage. Groove (110) that is designed to have a magnetic reluctance smaller than those between the permanent magnet and teeth (46) and those between the end of the permanent magnet and the end of the adjacent permanent magnet. Thereby, the magnetic flux leakage is reduced, and the magnetic flux generated from the end of the permanent magnet passes through teeth (46), which substantially enhances a motor efficiency.

Regarding claim 2, wherein the embedded magnets extend substantially radially through said rotor body (figs 6A-7B).

Regarding claim 3, wherein said at least one groove (110) axially extends along the outer surface of the rotor body since the groove (110) is formed at the outer surface of the entire rotor core.

Regarding claim 4, wherein the rotor body further comprises a plurality of cylindrical laminations (50).

Regarding claim 12, wherein said groove (110) is disposed about an end face of at least one of said permanent magnets (figs 6A-7B).

Regarding claim 13, wherein rotor core is a laminated core with groove (110); inherently, each lamination (50) includes at least one notch (110) on a surface thereof for forming the axial groove on the rotor core's outer surface.

Regarding claim 14, wherein a plurality of laminations (50) each including at least one notch are arranged on the rotor body to form a groove (20) (Fig 6A) (col. 5, lines 29-30).

Regarding claim 15, wherein said groove (110) is axially aligned with an axis of the rotor.

Regarding claim 23, the electric machine with the rotor assembly further comprising a stator (45).

Regarding claim 24, Kim discloses an electrical machine comprising a substantially cylindrical stator (45) concentrically aligned with a rotor (100), wherein

the outer surface of the rotor (100) and the inner surface of the stator (45) defining a substantially cylindrical gap (figs 6B-7B),

the gap having a plurality of protrusions, formed by groove (110) for manipulating an internal magnetic flux.

Regarding claim 25, wherein the plurality of protrusions are defined by grooves (110) in at least one of the outer surface of the rotor (100).

Regarding claim 26, wherein the stator further comprises at least one stator pole (46).

Regarding claim 27, wherein the plurality of protrusions, which formed by groove (110) extend axially along the length of the gap.

Art Unit: 2834

Regarding claim 29, Kim discloses an electric motor comprising a stator (45) substantially housing a rotor (100), the rotor having an outer surface and a body, the body adapted to receive at least one magnetic element, particularly permanent magnet element, and the outer surface having a notch (110) formed thereon.

Regarding claim 30, wherein the rotor further comprises several layers (50) of lamination.

Regarding claim 31, wherein the outer surface has a plurality of notches (110) disposed around the circumferential outer surface.

Regarding claim 33, wherein the notch (110) forms a groove along an axial length of the rotor.

3. **Claims 6-8, 18-22, 24-28, and 35-38** are rejected under 35 U.S.C. **102(b)** as being fully anticipated by **Harm et al (US 4,933,584)**.

Harm discloses an electric machine (figs 1, 2A-B, 3-5) having a stator assembly for an electrical machine, comprising:

a stator body of having stator poles (108, 224, 524), said stator poles having end faces facing an air-gap between the stator assembly and a rotor of the electrical machine (fig. 1);
wherein at least one groove (118, 208, 228, 302, 502) is formed in said end faces of said stator poles.

Regarding claim 7, wherein the at least one groove (502) is skewed.

Regarding claim 8, wherein the stator body further comprises a plurality of laminated sheets (202), each sheet including a yoke section and stator pole sections (figs 1, 3-5).

Regarding claim 18, wherein the at least one groove (502) extends along the length of said end faces about the axial direction of the stator body.

Regarding claim 19, wherein the end face of at least one pole section defines a notch that define groove (118, 208, 228, 302, 502).

Regarding claim 20, wherein said laminated sheets are arranged such that the at least one groove (302, 502) extends along an axial length of the stator assembly (fig 5).

Art Unit: 2834

Regarding claim 21, wherein said at least one groove (502) extending along the axial length of the stator assembly is skewed (fig 5).

Regarding claim 22, the stator assembly further comprising a rotor (100).

Regarding claim 24, *Harm* discloses an electrical machine (figs 1, 2A-B, 3-5) comprising a substantially cylindrical stator (106) concentrically aligned with a rotor (100), wherein

the outer surface of the rotor (100) and the inner surface of the stator (106) defining a substantially cylindrical gap (fig 1),

the gap having a plurality of protrusions, formed by groove (110) for manipulating an internal magnetic flux.

Regarding claim 25, wherein the plurality of protrusions are defined by grooves (118, 208, 228, 302, 502) in the inner surface of the stator.

Regarding claim 26, wherein the stator further comprises at least one stator pole (108, 224, 524).

Regarding claims 27-28, wherein the plurality of protrusions, which formed by skewed groove (502) extend axially along the length of the gap.

Regarding claim 35, *Harm* discloses an electric motor comprising a stator (106) for receiving a rotor (100), the stator having a plurality of poles (108, 224, 524) stemming from the stator body toward the rotor, the rotor having an outer surface facing the plurality of poles; wherein at least one of said poles defines a groove (118, 208, 228, 302, 502) at an end surface facing the outer surface of the rotor.

Regarding claim 36, wherein the groove extends axially along an axis of the stator (fig 5).

Regarding claim 37, wherein the groove (502) extend skewedly along an axis of the stator.

Regarding claim 38, wherein the groove manipulates a magnetic flux of the rotor by reducing magnetic leakage; thus, reduce cogging torque.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 16-17, 28, 32 and 34** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Banzi** (or alternately **Kim**), as applied in the rejections of the base claims, and in view of **Harm**.

Regarding claims 16-17, 28 and 34, Banzi (or alternately **Kim**) discloses the claimed invention, except for the groove in the outer surface of the rotor core being configured with a skewed angle, or not in alignment, with respect to the rotary axis thereof.

Harm, however, teaches that in an electric motor, which having electromagnetic stator and permanent magnet rotor, the cogging torque can be substantially eliminated by skewing either the magnetic field of the rotor assembly, or by skewing the stator assembly (col 6, lines 33-37). In other words, either the rotor poles or the stator poles should be provided with skewed notches for the purpose of reducing cogging between the rotor and the stator assemblies by, as the rotor rotates, distributing the magnetic flux so that a substantially constant air gap energy is provided. Therefore, for the purpose of enhancing the motor torque by further reducing the cogging thereof, as taught by Harm, it would have been obvious to an artisan to form the Banzi's or Kim's rotor grooves at a skewed angle, i.e., off alignment, with respect to the axial axis thereof.

Thus, by applying Harm's teaching, it would have been obvious to one skilled in the art at the time the invention was made to modify rotor's groove by configuring a skewed groove with respect to the axial axis thereof. Doing so would enhance the motor torque by further reducing the cogging thereof.

Regarding claim 32, wherein *the plurality of notches are randomly distributed on the outer surface of the rotor*, both Banzi and Kim individually discloses the purpose of the notches is to

Art Unit: 2834

reduce magnetic flux leakage in the rotor in order to minimize cogging torque thereof. Those skilled in the art would understand that the important teaching of the refs is to provide notches in the outer surface along the circumference of the rotor for minimize cogging by reducing magnetic flux leakage. Thus, it would have been obvious to one skilled in the art to rearrange the notches to be distributed either at equally intervals, as discloses by the refs, or at random, as claimed, because this would not alter the main purpose of the notches to enhance output torque of the motor by eliminating cogging that is caused by magnetic flux leakage.

Hence, it would have been obvious to one skilled in the art at the time the invention was made to modify rotor's notches as randomly distributed on the outer surface of the rotor. Doing so still provide means to reduce cogging and enhance motor's torque. Furthermore, it has been held that rearranging parts of an invention involves only routine skill in the art. *In re Japikse*, 86 USPQ 70.

Conclusion

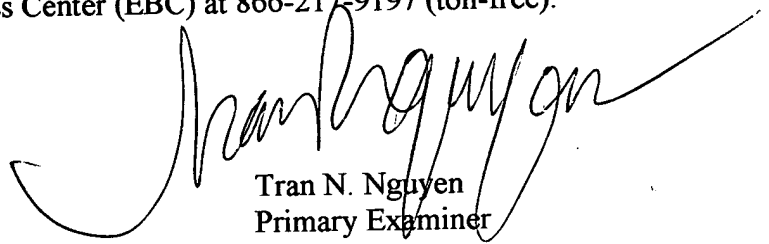
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tran N. Nguyen whose telephone number is (571) 272-2030.

The examiner can normally be reached on M-F 7:00AM-4:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Darren Schuberg can be reached on (571)-272-2044. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2834

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Tran N. Nguyen
Primary Examiner
Art Unit 2834